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United States Department of the Interior

GEOLOGICAL SURVEY  
EROS Data Center  
Sioux Falls, South Dakota 57198

*Quarterly*  
**E85-10076**

*NASA-CR-174403*

November 6, 1984

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Memorandum

To: Technical Officer

From: Principal Investigator AN 31

Subject: Quarterly Report: Landsat 4 Investigation of Thematic Mapper  
and Multispectral Scanner Applications (PCN902-91548; S-10757-C)  
(November 1984)

1) Problems

No problems occurred this quarter.

2) Accomplishments

a) A study comparing methods of selecting optimum TM band combinations for visual interpretation of the data is nearing completion. Two statistical methods and visual interpretation by experienced photointerpreters are being compared, using photographic chips of 1:250,000-scale prints and the digital equivalent of the chips. Four selections of 12 image features from two August 12, 1983 TM scenes were ranked according to their selection by the three methods. Results suggest visual interpretation procedures select different optimum band combinations than the two statistical methods. Since visual interpretation is spatially as well as spectrally related and the statistical procedures are only spectrally related, it is not surprising that the procedures selected different optimum band combinations.

b) A mosaic of TM data was made of the Great Salt Lake area of Utah. This mosaic was requested due to the general flooding and overfilling of this lake. Upon completion of filtering the TM Great Salt Lake mosaic to suppress detector swathing, the Laser Beam Recorder (LBR) prints of the intended three band composite were inspected. A review of the filtering process was made since the results were not satisfactory. Following are some recommended guidelines for making TM image map mosaics.

Extra time and care must be taken in examining the data when considering which TM images to include in the map. There are more data anomalies in TM on Landsats 4 and 5 than any of the three previous Landsat MSS satellites. These data problems are not predictable (i.e., whether swathing or total line drops, they do not necessarily occur in the same channels or patterns).

(E85-10076 NASA-CR-174403) LANDSAT 4  
INVESTIGATION OF THEMATIC MAPPER AND  
MULTISPECTRAL SCANNER APPLICATIONS  
Quarterly Report (EROS Data Center, Sioux  
Falls, S. Dak.) 3 p EC A02/MF A01 CSCL 05B G3/43

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Bad data must be detected and dealt with before the image is transformed as successful filtering is more difficult when the anomaly is not parallel to the scan line. Also, filtering should be performed on each image and not the entire mosaic since it is more than likely that reflectance anomalies will differ from band to band, scene to scene, and date to date.

It is advisable that a subscene, say 512 lines by 512 samples, be used as a test case when trying to determine the parameter values of the digital filters.

Finally, two phenomena which are seen in the filtered images, ringing around land and water boundaries and more pronounced swathing closer to the land and water shoreline, suggests that individual filtering, then contrast enhancement on land with the water masked and vice versa, should produce a better product.

- c) An ongoing study of Landsat 5 TIPS quality is being made. Early results indicate detector/sensor striping is a problem with 30 percent of images in May of 1984 to 13 percent in September of 1984. Pixel noise has consistently 1-2 percent of the data starting in and ending in September. Bit slips averaged about 10 percent while calibration density differences averaged 6 percent during this period.

Landsat 4 TIPS on the other hand averaged 26 percent major detector/sensor striping for the period November 1983 to April 1984. Bit slips in Landsat 4 averaged 9 percent for this period or about the same as Landsat 5. Likewise, calibration density differences for the two satellites were the same but pixel noise was 5 percent for Landsat 4 as compared to 1-2 percent for Landsat 5. These numbers were computed as percentages of all TIPS scenes entered into the EDC's Main Image File.

### 3) Significant Results

Band combinations used in interpretation may be different for manual interpretation and digital computer interpretation. The making of digital mosaics requires closer attention to filter parameters and image selection than was necessary with MSS data.

Early results of a TIPS quality study indicate about the same percentage defects in Landsat 5 as Landsat 4.

### 4) Publications

McCord, J. R., Binnie, D. R., and Seevers, P. M., Digital to Analog Conversion and Visual Evaluation of Thematic Mapper Data, Sioux Falls, South Dakota, 1984 (submitted to Journal of Applied Photographic Engineering).

5) Recommendations

None

6) Data Utility

Excellent except as noted previously.

  
Donald T. Lauer